DOCUMENT RESUME

ED 090 004 SE 017 557

AUTHOR	Thompson, Russ; Fuller, Albert
TITLE	Basic Math I, Package 01-05, Multiplication and Division of the Numbers of Arithmetic.
INSTITUTION	Arnold Public Schools, Nebr.
SPONS AGENCY	Bureau of Elementary and Secondary Education (DHEW/OE), Washington, D.C.
PUB DATE	72
NOTE	30p.; For related documents, see SE 017 553 through 556 and SE 017 558 through 575
EDRS PRICE	MF-$0.75 HC-$1.85 PLUS POSTAGE
DESCRIPTORS	Division; *Fractions; Grade 9; Individualized Instruction; *Instructional Materials; Multiplication; Objectives; *Secondary School Mathematics; *Teaching Guides; *Tests
IDENTIFIERS	Elementary Secondary Education Act Title III; ESEA Title III; *General Mathematics

ABSTRACT

This teacher guide is part of the materials prepared for an individualized program for ninth-grade algebra and basic mathematics students. Materials written for the program are to be used with audiovisual lessons recorded on tape cassettes. For an evaluation of the program, see ED 086 545. In this guide, the teacher is provided with objectives for each topic area and guided to materials written for a given topic. Three short criterion tests are included for each topic covered. A review of fractions is presented in this package. The work deals with equivalent fractions and with multiplication and division of fractions. This work was prepared under an ESEA Title III contact. (JP)

U.S. DEPARTMENT OF HEALTH,
EDUCATION & WELFARE
NATIONAL INSTITUTE OF
EDUCATION
THIS DOCUMENT HAS BEEN REPRODUCED EXACTLY AS RECEIVED FROM THE PERSON OR ORGANIZATION ORIGINATING IT. POINTS OF VIEW OR OPINIONS STATED DO NOT NECESSARILY REPRESENT OFFICIAL NATIONAL INSTITUTE OF EDUCATION POSITION OR POLICY

ED090004

BASIC MATH I

PACKAGE 01-05

MULTIPLICATION AND DIVISION OF THE NUMBERS OF ARITHMETIC

Prepared by

Russ Thompson and Albert Fuller

Under a Grant From
ESEA Title III, Nebraska Department of Education
Jack Baillie, Administrator
to
Arnold Public Schools, Arnold, Nebraska

© ARNOLD PUBLIC SCHOOLS 1972

PERMISSION TO REPRODUCE THIS COPYRIGHTED MATERIAL HAS BEEN GRANTED BY

Russell Thompson
Albert Fuller

TO ERIC AND ORGANIZATIONS OPERATING UNDER AGREEMENTS WITH THE NATIONAL INSTITUTE OF EDUCATION. FURTHER REPRODUCTION OUTSIDE THE ERIC SYSTEM REQUIRES PERMISSION OF THE COPYRIGHT OWNER.

SE 017 557

Until now we have been dealing with whole numbers and natural numbers. You will recall that whole numbers are the set of numbers {0, 1, 2, 3, ...}. You will notice that there are no fractions in the set of whole numbers.

In Package #4 we confined our consideration to the natural numbers. The natural numbers are the set {1,2,3,4,...}. You will notice that the natural numbers are all of the whole numbers except zero.

We now turn our attention to the numbers of arithmetic. You are aware that there are such things as fractions. The numbers of arithmetic are all of the whole numbers and fractions. A fraction is a number of arithmetic that is not a whole number.

The Goal of Package #5 is to develop accuracy in multiplying and dividing the numbers of arithmetic so that we can use those skills to solve applied problems.

PACKAGE OBJECTIVES:

1. Given a problem in naming a number of arithmetic with a fractional numeral, solve it.

2. Given a fraction, write another numeral for the same number or given two fractional numerals, determine if they name the same number.

3. Given any two numbers of arithmetic, write their product.

4. Given a fractional numeral, rename it with a different denominator.

5. Given an applied problem which leads to a division involving fractional numerals, solve it.

I.U. # 01-05-01

THE NUMBERS OF ARITHMETIC

OBJECTIVES:

1. Given an object which has been divided into a number of equal parts, write a fractional numeral for part of it.

2. Given a set of objects, write a fractional numeral for a given part of it.

3. Given a fractional numeral, identify its numerator and denominator.

4. Given a numeral such as n/n, rename it as 1.

5. Given a numeral such as 0/n, rename it as 0.

6. Given a numeral such as n/1, rename it as n.

7. Given a problem in naming a number of arithmetic with a fractional numeral, solve it.

ACTIVITIES:

1. Study pages 149-150 and do margin ex. 1 - 19.(Objectives 1, 2)

2. Study bottom 1/3 of page 150 and do margin exercises 20 - 23.(Objective 3)

3. Study page 151 "Fractional Numerals for One", and do margin ex. 24 - 28. (Objective 4)

4. Study page 151 "Fractional Numerals for Zero" and do margin ex. 29 - 33.(Objective 5)

5. Study page 152 "Fractional Numerals for Whole Numbers" and do margin ex. 34 - 40. (Objective 6)

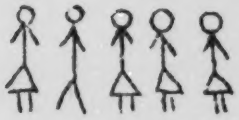
6. Study page 152 "Another Use for Fractional Numerals" and do margin ex. 41 - 42. (Objective 2)

7. Do the odd numbered exercises, Set 1, pages 165-166. (Objective 7)

CRITERION TESTS

Criterion Test 01-05-01-01

1. Name the shaded part with a fractional numeral.

2.  Name with a fractional numeral the part of this group which are boys.

3. In the fraction $\frac{14}{27}$
   (a) name the numerator
   (b) name the denominator

4. Simplify the following fractional numerals:

   (a) $\frac{5}{5}$ (b) $\frac{25}{25}$ (c) $\frac{175}{175}$

5. Simplify:

   (a) $\frac{0}{10}$ (b) $\frac{0}{20}$ (c) $\frac{0}{30}$

6. Simplify:

   (a) $\frac{10}{1}$ (b) $\frac{20}{1}$ (c) $\frac{30}{1}$

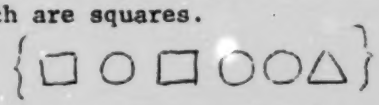
7. Name as a fractional numeral:

   (a) 0 (b) 1 (c) 15 (d) the shaded part

Criterion Test 01-05-01-02

1. Name the shaded part with a fractional numeral.

2. Name with a fractional numeral the part of this set which are squares.



3. Name the numerator and denominator in $\frac{14}{3}$

4. Simplify:

   (a) $\frac{4}{4}$ (b) $\frac{1250}{1250}$ (c) $\frac{n}{n}$

5. Simplify:

   (a) $\frac{0}{25}$ (b) $\frac{0}{32}$ (c) $\frac{0}{n}$

6. Simplify:

   (a) $\frac{25}{1}$ (b) $\frac{26}{1}$ (c) $\frac{27}{1}$

7. Name as a fractional numeral:

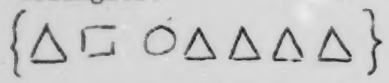
   (a) (b) 1 (c) 0 (d) 25

   the shaded part

Criterion Test 01-05-01-03

1. Name the shaded part with a fractional numeral.

2. Name with a fractional numeral the part of the set that is triangles.



3. Name the numerator and denominator of $\frac{14}{171}$

4. Simplify:

   (a) $\frac{5}{5}$ (b) $\frac{6}{6}$ (c) $\frac{7}{7}$

5. Simplify:

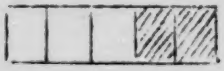
   (a) $\frac{0}{14}$ (b) $\frac{0}{15}$ (c) $\frac{0}{16}$

6. Simplify:

   (a) $\frac{14}{1}$ (b) $\frac{15}{1}$ (c) $\frac{16}{1}$

7. Name as a fractional numeral:

   (a) 1 (b) the shaded part (c) 14 (d) 0



ANSWERS TO CRITERION TESTS

Criterion Test 01-05-01-01

1. $\frac{4}{8}$ or $\frac{1}{2}$ 2. $\frac{1}{5}$ 3. numerator 14 denominator 27

4. (a) 1 (b) 1 (c) 1

5. (a) 0 (b) 0 (c) 0

6. (a) 10 (b) 20 (c) 30

7. (a) $\frac{0}{n}$ or $\frac{0}{2}$ or $\frac{0}{5}$ etc. (b) $\frac{n}{n}$, $\frac{2}{2}$ etc. (c) $\frac{15}{1}$ (d) $\frac{1}{4}$

Criterion Test 01-05-01-02

1. $\frac{2}{5}$ 2. $\frac{2}{6}$ or $\frac{1}{3}$ 3. numerator 14 denominator 3

4. (a) 1 (b) 1 (c) 1

5. (a) 0 (b) 0 (c) 0

6. (a) 25 (b) 26 (c) 27

7. (a) $\frac{1}{3}$ (b) $\frac{n}{n}$ or $\frac{5}{5}$ etc. (c) $\frac{0}{n}$, $\frac{0}{25}$, $\frac{0}{35}$ etc. (d) $\frac{25}{1}$

Criterion Test 01-05-01-03

1. $\frac{3}{8}$ 2. $\frac{5}{7}$ 3. numerator 14 denominator 171

4. (a) 1 (b) 1 (c) 1

5. (a) 0 (b) 0 (c) 0

6. (a) 14 (b) 15 (c) 16

7. (a) $\frac{25}{25}$, $\frac{n}{n}$, or $\frac{3}{3}$ etc. (b) $\frac{2}{5}$ (c) $\frac{14}{1}$ (d) $\frac{0}{x}$, $\frac{0}{13}$, or $\frac{0}{27}$ etc.

I. U. #01 05-02

Equality of Numbers of Arithmetic

OBJECTIVES:

1. Given a fractional numeral, multiply the numerator and denominator by a number greater than 0 to obtain other numerals for the same number.

2. Given two fractional numerals, tell whether they name the same number, using cross products.

ACTIVITIES:

1. Study page 153 and do margin exercises 43 - 47. (Objective 1)

2. Study pages 154, 155 and do margin exercises 48 - 63. (Objective 2)

3. Write the odd numbered exercises on pages 167, 168. (Objectives 1, 2)

Criterion Test 01-05-02-01

1. In each case multiply the numerator and denominator by the number in parentheses repeatedly to obtain three other numerals for the same number.

   (a) $\frac{2}{3}$ (2) (b) $\frac{1}{2}$ (3) (c) $\frac{2}{5}$ (3)

2. Using cross products, test the following pairs of numbers to see if both name the same number. Answer "yes" if they do and "no" if they don't.

   (a) $\frac{4}{5}$, $\frac{9}{10}$ (b) $\frac{3}{9}$, $\frac{1}{3}$ (c) $\frac{17}{18}$, $\frac{18}{20}$

Criterion Test 01-05-02-02

1. Multiply the numerator and denominator by the number in parentheses repeatedly to obtain three other numerals for the same number.

   (a) $\frac{3}{5}$ (4) (b) $\frac{4}{5}$ (2) (c) $\frac{6}{5}$ (3)

2. Using cross products, test the following pairs of numbers to see if both name the same number. Answer "yes" if they do and "no" if they don't.

   (a) $\frac{3}{4}$, $\frac{4}{12}$ (b) $\frac{6}{9}$, $\frac{3}{6}$ (c) $\frac{9}{12}$, $\frac{3}{4}$

Criterion Test 01-05-02-03

1. Multiply the numerator and denominator by the number in parentheses repeatedly to obtain three other numerals for the same number.

   (a) $\frac{2}{3}$ (5) (b) $\frac{3}{4}$ (2) (c) $\frac{4}{5}$ (3)

2. Using cross products, test the following pairs of numbers to see if both name the same number. Answer "yes" if they do and "no" if they don't.

   (a) $\frac{7}{8}$, $\frac{14}{16}$ (b) $\frac{3}{2}$, $\frac{9}{6}$ (c) $\frac{7}{6}$, $\frac{20}{24}$

Answers to Criterion Tests

Test 01-05-02-01

1. (a) $\frac{4}{6}, \frac{8}{12}, \frac{16}{24}$ (b) $\frac{3}{6}, \frac{9}{18}, \frac{27}{54}$

   (c) $\frac{6}{15}, \frac{18}{45}, \frac{54}{135}$

2. (a) No (b) Yes (c) No

Test 01-05-02-02

1. (a) $\frac{12}{20}, \frac{48}{80}, \frac{192}{320}$ (b) $\frac{8}{10}, \frac{16}{20}, \frac{32}{40}$

   (c) $\frac{18}{15}, \frac{54}{45}, \frac{162}{135}$

2. (a) No (b) No (c) Yes

Test 01-05-02-03

1. (a) $\frac{10}{15}, \frac{50}{75}, \frac{250}{375}$ (b) $\frac{6}{8}, \frac{12}{16}, \frac{24}{32}$

   (c) $\frac{12}{15}, \frac{36}{45}, \frac{108}{135}$

2. (a) Yes (b) Yes (c) No

I. U. #01-05-03

Multiplication: Fractional Numbers

You will need to recall:

The commutative and associative laws of multiplication for whole numbers. The commutative and associative laws for the numbers of arithmetic are the same, so that we can now make further use of what we already know.

OBJECTIVES:

1. When asked to state the definition for multiplication of fractions, you will state: "For any arithmetic numbers $\frac{a}{b}$ and $\frac{c}{d}$, $\frac{a}{b} \cdot \frac{c}{d} = \frac{a \cdot c}{b \cdot d}$

2. When asked to state the commutative law for multiplication of the numbers of arithmetic, state it.

3. When asked to state the associative law for multiplication of the numbers of arithmetic, state it.

4. Given any two numbers of arithmetic, write their product.

ACTIVITIES:

1. Study page 156 in AAMA, and do margin exercises 64 - 72. (Objective 1)

2. Study page 157 and do margin exercises 73 - 80. (Objectives 2, 3)

3. Study page 158 and do margin exercises 81 - 88. (Objective 4)

Criterion Test 01-05-03-01

1. State the definition for multiplication of fractions.
2. State the commutative law for multiplication of the numbers of arithmetic.
3. State the associative law for multiplication of the numbers of arithmetic.
4. Multiply.

(a) $12 \cdot \frac{2}{3}$ (b) $10 \cdot \frac{1}{4}$ (c) $\frac{5}{9} \cdot \frac{2}{3}$

(d) $\frac{9}{5} \cdot \frac{4}{4}$ (e) $\frac{4}{10} \cdot \frac{5}{10}$ (f) $\frac{3}{8} \cdot \frac{1}{7}$

Criterion Test 01-05-03-02

1. State the definition for multiplication of fractions.
2. State the commutative law for multiplication of the numbers of arithmetic.
3. State the associative law for multiplication of the numbers of arithmetic.
4. Multiply.

(a) $4 \cdot \frac{5}{9}$ (b) $12 \cdot \frac{3}{4}$ (c) $\frac{2}{3} \cdot \frac{3}{4}$

(d) $\frac{8}{3} \cdot \frac{6}{5}$ (e) $\frac{7}{9} \cdot \frac{3}{3}$ (f) $\frac{1}{4} \cdot \frac{1}{3}$

Criterion Test 01-05-03-03

1. State the definition for multiplication of fractions.
2. State the commutative law for multiplication of the numbers of arithmetic.
3. State the associative law for multiplication of the numbers of arithmetic.
4. Multiply.

(a) $4 \cdot \frac{9}{5}$ (b) $7 \cdot \frac{3}{8}$ (c) $\frac{3}{5} \cdot \frac{2}{3}$

(d) $\frac{2}{5} \cdot \frac{3}{3}$ (e) $\frac{3}{5} \cdot \frac{4}{5}$ (f) $\frac{1}{2} \cdot \frac{3}{4}$

ANSWERS TO CRITERION TESTS

Criterion Test 01-05-03-01

1. For any arithmetic numbers $\frac{a}{b}$ and $\frac{c}{d}$,

$$\frac{a}{b} \cdot \frac{c}{d} = \frac{a \cdot c}{b \cdot d}$$

2. For any arithmetic numbers $\frac{a}{b}$ and $\frac{c}{d}$,

$$\frac{a}{b} \cdot \frac{c}{d} = \frac{c}{d} \cdot \frac{a}{b}$$

3. For any arithmetic numbers $\frac{a}{b}$, $\frac{c}{d}$, and $\frac{e}{f}$,

$$\frac{a}{b} \cdot \left(\frac{c}{d} \cdot \frac{e}{f}\right) = \left(\frac{a}{b} \cdot \frac{c}{d}\right) \cdot \frac{e}{f}$$

4. (a) $\frac{24}{3}$ (b) $\frac{10}{4}$, (c) $\frac{10}{27}$

(d) $\frac{36}{20}$ (e) $\frac{20}{100}$ (f) $\frac{3}{56}$

Criterion Test 01-05-03-02

1. For any arithmetic numbers $\frac{a}{b}$ and $\frac{c}{d}$,

$$\frac{a}{b} \cdot \frac{c}{d} = \frac{a \cdot c}{b \cdot d}$$

2. For any arithmetic numbers $\frac{a}{b}$ and $\frac{c}{d}$,

$$\frac{a}{b} \cdot \frac{c}{d} = \frac{c}{d} \cdot \frac{a}{b}$$

3. For any arithmetic numbers $\frac{a}{b}$, $\frac{c}{d}$, and $\frac{e}{f}$,

$$\frac{a}{b} \cdot \left(\frac{c}{d} \cdot \frac{e}{f}\right) = \left(\frac{a}{b} \cdot \frac{c}{d}\right) \cdot \frac{e}{f}$$

4. (a) $\frac{20}{9}$ (b) $\frac{36}{4}$ (c) $\frac{6}{12}$

(d) $\frac{48}{15}$ (e) $\frac{21}{27}$ (f) $\frac{1}{12}$

ANSWERS TO CRITERION TESTS

Criterion Test 01-05-03-03

1. For any arithmetic numbers $\frac{a}{b}$ and $\frac{c}{d}$,

$$\frac{a}{b} \cdot \frac{c}{d} = \frac{a \cdot c}{b \cdot d}$$

2. For any arithmetic numbers $\frac{a}{b}$ and $\frac{c}{d}$,

$$\frac{a}{b} \cdot \frac{c}{d} = \frac{c}{d} \cdot \frac{a}{b}$$

3. For any arithmetic numbers $\frac{a}{b}$, $\frac{c}{d}$, and $\frac{e}{f}$,

$$\frac{a}{b} \cdot \left(\frac{c}{d} \cdot \frac{e}{f}\right) = \left(\frac{a}{b} \cdot \frac{c}{d}\right) \cdot \frac{e}{f}$$

4. (a) $\frac{36}{5}$ (b) $\frac{21}{8}$ (c) $\frac{6}{15}$

(d) $\frac{6}{15}$ (e) $\frac{12}{25}$ (f) $\frac{3}{8}$

I. U. #01-05-04

Multiplying by One

You will need to recall:

1. The property of one for multiplication of whole numbers. It will be the same as the property of one for multiplication of the numbers of arithmetic.

OBJECTIVES:

1. Given a fractional numeral, rename it by multiplying it by a fractional numeral which names the number 1.

2. Given a fraction numeral, rename it with a given denominator.

3. Given a fractional numeral, simplify it.

4. Given a verbal problem, translate it into a number sentence and solve the resulting sentence.

ACTIVITIES:

1. Study page 159 and do margin exercises 89 - 95. (Objective 1)

2. Study page 160 "Changing numerals" and do margin exercises [redacted] 95 - 105. (Objective 2)

3. Study pages 160, 161 "Simplifying", and do margin exercises 106 - 119. (Objective 3)

4. Write the odd numbered exercises pages 171, 172 (Objectives 1, 2, 3, 4)

Criterion Test 01-05-04-01

1. Rename the following fractional numerals by multiplying it by a fractional numeral for one. Show your work.

   (a) $\frac{1}{2}$ (b) $\frac{2}{3}$ (c) $\frac{3}{4}$

2. For each number, multiply by one, choosing an appropriate numeral n/n, to find a fractional numeral having the denominator indicated.

   (a) $\frac{1}{4}$ (12) (b) $\frac{2}{3}$ (15) (c) $\frac{5}{8}$ (40)

3. Simplify.

   (a) $\frac{14}{21}$ (b) $\frac{22}{33}$ (c) $\frac{25}{100}$

   (d) $\frac{4}{5} \cdot \frac{10}{12}$ (e) $\frac{2}{3} \cdot \frac{6}{8}$

   (f) $\frac{12}{11} \cdot \frac{14}{3} \cdot \frac{22}{56}$

4. A student's tuition was $1500. His father paid 2/3 of the cost. How much did the father pay?

   (a) Translate into a mathematical sentence.

   (b) Solve the resulting sentence.

Criterion Test 01-05-04-02

1. Rename the following numbers. Show your work.

   (a) $\frac{5}{6}$ (b) $\frac{6}{7}$ (c) $\frac{7}{8}$

2. Rename the following numbers using a numeral with the indicated denominator.

   (a) $\frac{1}{4}$ (16) (b) $\frac{2}{3}$ (12) (c) $\frac{3}{8}$ (24)

3. Simplify.

   (a) $\frac{8}{16}$ (b) $\frac{24}{36}$ (c) $\frac{24}{12}$

   (d) $\frac{14}{55} \cdot \frac{11}{7}$ (e) $\frac{12}{13} \cdot \frac{26}{36}$

   (f) $\frac{2}{3} \cdot \frac{5}{4} \cdot \frac{9}{10}$

4. If John Doe receives $20 for working a full day, how much will he receive for working ½ day?

   (a) Translate into a number sentence.

   (b) Solve the resulting sentence.

Criterion Test 01-05-04-03

1. Rename the following numbers. Show your work.

   (a) $\frac{8}{9}$ (b) $\frac{9}{10}$ (c) $\frac{10}{11}$

2. Rename the following numbers with a numeral having the indicated denominator.

   (a) $\frac{8}{9}$ (18) (b) $\frac{9}{10}$ (30) (c) $\frac{10}{11}$ (44)

3. Simplify.

   (a) $\frac{27}{36}$ (b) $\frac{24}{32}$ (c) $\frac{24}{28}$

   (d) $\frac{12}{15} \cdot \frac{5}{24}$ (e) $\frac{12}{15} \cdot \frac{1}{12}$

   (f) $\frac{2}{3} \cdot \frac{5}{6} \cdot \frac{3}{8}$

4. Mr. Walker can walk 5/8 of a mile in one hour. At that rate how far will he walk in seven hours?

   (a) Translate into a mathematical sentence.

   (b) Solve the sentence.

ANSWERS TO CRITERION TESTS

Criterion Test 01-05-04-01

1. (a) $\frac{1}{2} \cdot \frac{2}{2} = \frac{2}{4}$ or $\frac{1}{2} \cdot \frac{3}{3} = \frac{3}{6}$ or $\frac{1}{2} \cdot \frac{4}{4} = \frac{4}{8}$ or $\frac{1}{2} \cdot \frac{5}{5} = \frac{5}{10}$ etc.

   (b) $\frac{2}{3} \cdot \frac{2}{2} = \frac{4}{6}$ or $\frac{2}{3} \cdot \frac{3}{3} = \frac{6}{9}$ or $\frac{2}{3} \cdot \frac{4}{4} = \frac{8}{12}$ or $\frac{2}{3} \cdot \frac{5}{5} = \frac{10}{15}$ etc.

   (c) $\frac{3}{4} \cdot \frac{2}{2} = \frac{6}{8}$ or $\frac{3}{4} \cdot \frac{3}{3} = \frac{9}{12}$ or $\frac{3}{4} \cdot \frac{4}{4} = \frac{12}{16}$ or $\frac{3}{4} \cdot \frac{5}{5} = \frac{15}{20}$ etc.

2. (a) $\frac{1}{4} \cdot \frac{3}{3} = \frac{3}{12}$ (b) $\frac{2}{3} \cdot \frac{5}{5} = \frac{10}{15}$ (c) $\frac{5}{8} \cdot \frac{5}{5} = \frac{25}{40}$

3. (a) $\frac{2}{3}$ (b) $\frac{2}{3}$ (c) $\frac{1}{4}$ (d) $\frac{2}{3}$ (e) $\frac{1}{2}$ (f) 2

4. (a) n = the amount father paid
   $\frac{2}{3} \cdot 1500 = n$
   (b) n = 1000 His father paid $ 1000.00

Criterion Test 01-05-04-02

1. (a) $\frac{5}{6} \cdot \frac{2}{2} = \frac{10}{12}$ or $\frac{5}{6} \cdot \frac{3}{3} = \frac{15}{18}$ or $\frac{5}{6} \cdot \frac{4}{4} = \frac{20}{24}$ or $\frac{5}{6} \cdot \frac{5}{5} = \frac{25}{30}$ etc.

   (b) $\frac{6}{7} \cdot \frac{2}{2} = \frac{12}{14}$ or $\frac{6}{7} \cdot \frac{3}{3} = \frac{18}{21}$ or $\frac{6}{7} \cdot \frac{4}{4} = \frac{24}{28}$ or $\frac{6}{7} \cdot \frac{5}{5} = \frac{30}{35}$ etc.

   (c) $\frac{3}{8} \cdot \frac{2}{2} = \frac{6}{16}$ or $\frac{3}{8} \cdot \frac{3}{3} = \frac{9}{24}$ or $\frac{3}{8} \cdot \frac{4}{4} = \frac{12}{32}$ or $\frac{3}{8} \cdot \frac{5}{5} = \frac{15}{40}$ etc.

2. (a) $\frac{1}{4} \cdot \frac{4}{4} = \frac{4}{16}$ (b) $\frac{2}{3} \cdot \frac{4}{4} = \frac{8}{12}$ (c) $\frac{3}{8} \cdot \frac{3}{3} = \frac{9}{24}$

3. (a) $\frac{1}{2}$ (b) $\frac{2}{3}$ (c) 2 (d) $\frac{2}{5}$ (e) $\frac{2}{3}$ (f) $\frac{3}{4}$

4. (a) n = the amount he receives for $\frac{1}{4}$ day
   Then $n = \frac{1}{4} \cdot 20$

   (b) n = 5 He receives $5.00 for $\frac{1}{4}$ day.

ANSWERS, CONTINUED

Criterion Test 01-05-04-03

1. (a) $\frac{8}{9} \cdot \frac{2}{2} = \frac{16}{18}$ or $\frac{8}{9} \cdot \frac{3}{3} = \frac{24}{27}$ or $\frac{8}{9} \cdot \frac{4}{4} = \frac{32}{36}$ or $\frac{8}{9} \cdot \frac{5}{5} = \frac{40}{45}$ etc.

   (b) $\frac{9}{10} \cdot \frac{2}{2} = \frac{18}{20}$ or $\frac{9}{10} \cdot \frac{3}{3} = \frac{27}{30}$ or $\frac{9}{10} \cdot \frac{4}{4} = \frac{36}{40}$ or $\frac{9}{10} \cdot \frac{5}{5} = \frac{45}{50}$ etc.

   (c) $\frac{10}{11} \cdot \frac{2}{2} = \frac{20}{22}$ or $\frac{10}{11} \cdot \frac{3}{3} = \frac{30}{33}$ or $\frac{10}{11} \cdot \frac{4}{4} = \frac{40}{44}$ or $\frac{10}{11} \cdot \frac{5}{5} = \frac{50}{55}$ etc.

2. (a) $\frac{8}{9} \cdot \frac{2}{2} = \frac{16}{18}$ (b) $\frac{9}{10} \cdot \frac{3}{3} = \frac{27}{30}$ (c) $\frac{10}{11} \cdot \frac{4}{4} = \frac{40}{44}$

3. (a) $\frac{3}{4}$ (b) $\frac{3}{4}$ (c) $\frac{6}{7}$ (d) $\frac{1}{6}$ (e) $\frac{1}{15}$ (f) $\frac{5}{24}$

4. (a) n = how far he will walk in 7 hours
   then $\frac{5}{8} \cdot 7 = n$

   $n = \frac{35}{8}$ He will walk $\frac{35}{8}$ miles.

I. U. 421-05-05

Reciprocals and Division

OBJECTIVES:

1. When asked to name the property of reciprocals you will write "For any number of arithmetic $\frac{a}{b}$ where a and b are not zero, $\frac{a}{b} \cdot \frac{b}{a} = 1$"

2. When asked to define a reciprocal you will write "The reciprocal of $\frac{a}{b}$ is $\frac{b}{a}$."

3. When asked to state the rule for division of the numbers of arithmetic you will state "We can divide by multiplying by a reciprocal."

4. Given a non zero arithmetic number, write its reciprocal.

5. Given a division problem involving fractional numerals, write the quotient.

6. Given an applied problem leading to a division involving fractions, translate it into a mathematical sentence and solve the resulting sentence.

ACTIVITIES:

1. Study page 162 "Reciprocals", AAMA, and do margin exercises 120 - 130 (Objectives 1, 2)

2. Study pages 162, 163 "Division" and do margin exercises 131 - 142. (Objectives 3, 4, 5)

3. Do selected odd numbered exercises from exercise set 5, pages 173, 174 (Objectives 5, 6)

Criterion Test 01-05-05-01

1. Name the property of reciprocals.
2. Define a reciprocal.
3. State the rule for division of the numbers of arithmetic.
4. Write the reciprocal.

   (a) $\frac{2}{3}$ (b) $\frac{5}{2}$ (c) 4

5. Write the quotient.

   (a) $\frac{1}{3} \div \frac{4}{5}$ (b) $24 \div \frac{4}{6}$ (c) $\frac{7}{8} \div 56$

6. How many test tubes each holding $\frac{3}{4}$ oz. can be filled from 60 ounces?

   (a) Translate into a mathematical sentence.

   (b) Solve the sentence.

Criterion Test 01-05-05-02

1. Name the property of reciprocals.
2. Define a reciprocal.
3. State the rule for division of the numbers of arithmetic.
4. Write the reciprocal.

   (a) $\frac{7}{9}$ (b) $\frac{11}{3}$ (c) 8

5. Write the quotient.

   (a) $\frac{1}{2} \div \frac{5}{6}$ (b) $36 \div \frac{12}{15}$ (c) $\frac{5}{8} \div 15$

6. Miles A. Plenty drove 75 miles and had completed $\frac{5}{8}$ of his trip. How many miles was Miles' total trip?

   (a) Translate into a mathematical sentence.

   (b) Solve the sentence.

Criterion Test 01-05-05-03

1. Name the property of reciprocals.

2. Define a reciprocal.

3. State the rule for division of the numbers of arithmetic.

4. Write the reciprocal.

   (a) $\frac{3}{4}$ (b) $\frac{5}{8}$ (c) 7

5. Write the quotient.

   (a) $\frac{3}{8} \div \frac{3}{2}$ (b) $\frac{2}{7} \div 5$ (c) $5 \div \frac{2}{7}$

6. A piece of wire is $\frac{5}{6}$ yard long. If it is cut into three equal pieces, how long will each piece be?

   (a) Translate into a mathematical sentence.

   (b) Solve the sentence.

Answers to Criterion Tests

Test 01-05-05-01

1. For any number of arithmetic $\frac{a}{b}$, where a and b are not zero, $\frac{a}{b} \cdot \frac{b}{a} = 1$.

2. The reciprocal of $\frac{a}{b}$ is $\frac{b}{a}$.

3. We can divide by multiplying by a reciprocal.

4. (a) $\frac{3}{2}$ (b) $\frac{2}{5}$ (c) $\frac{1}{4}$

5. (a) $\frac{5}{12}$ (b) 36 (c) $\frac{1}{64}$

6. (a) Let n = the number of test tubes

   Then $\frac{3}{4} \cdot n = 60$

   (b) $n = 60 \div \frac{3}{4}$, $n = 80$

   80 test tubes could be filled.

Test 01-05-05-02

1. For any number of arithmetic $\frac{a}{b}$, where a and b are not zero, $\frac{a}{b} \cdot \frac{b}{a} = 1$.

2. The reciprocal of $\frac{a}{b}$ is $\frac{b}{a}$.

3. We can divide by multiplying by a reciprocal.

4. (a) $\frac{9}{7}$ (b) $\frac{3}{11}$ (c) $\frac{1}{8}$

5. (a) $\frac{3}{5}$ (b) 45 (c) $\frac{1}{24}$

6. (a) let n = the number of miles of the total trip.

   Then $\frac{5}{8} \cdot n = 75$

   (b) $n = 75 \div \frac{5}{8}$, $n = 120$

   The trip is 120 miles long.

Answers to Criterion Tests (Cont.)

Test 01-05-05-03

1. For any number of arithmetic $\frac{a}{b}$, where a and b are not zero, $\frac{a}{b} \cdot \frac{b}{a} = 1$.

2. The reciprocal of $\frac{a}{b}$ is $\frac{b}{a}$

3. We can divide by multiplying by a reciprocal.

4. (a) $\frac{4}{3}$ (b) $\frac{8}{5}$ (c) $\frac{1}{7}$

5. (a) $\frac{1}{4}$ (b) $\frac{2}{35}$ (c) $\frac{35}{2}$

6. (a) Let n = the length of each piece

   Then $3 \cdot n = \frac{5}{6}$

   (b) $n = \frac{5}{6} \div 3$, $n = \frac{5}{18}$

   Each piece is $\frac{5}{8}$ yard long.

THE END

Package 01-05